

APPENDIX K:

Conceptual Site Model and Data Usability Representativeness Evaluation

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CONCEPTUAL SITE MODEL AND DATA USABILITY & REPRESENTATIVENESS EVALUATION

1.0 CONCEPTUAL SITE MODEL

The subject property, addressed as 169.2 Bridge Street in Lowell, Massachusetts, is currently owned by Massachusetts Mills III Limited Partnership. This 1.084-acre property is identified as Lot 3B on the Plan of Land recorded at the Middlesex North District Registry of Deeds in Plan Book 238 Plan 16 on June 27, 2014. This property contains a Boiler House constructed sometime around 1911, Section 10 of the Picker Building and a courtyard. The Boiler House was used to generate steam power first by using coal, and then sometime in the 1950s by using no. 6 fuel oil. The Boiler House has been vacant since at least 1965, when a fire damaged the building. A coal bunker/chute, abandoned no. 6 fuel oil vaults or bunkers, two gasoline underground storage tanks (USTs), a smoke stack, a utility vault and four dry wells were present in the courtyard as recently as 2016. During early 2016, the gasoline USTs were removed from the Site. Until recently, the surface of the courtyard was filled with debris, some was evidently there for a long time and some was placed more recently as a result of renovation activities in the Picker Building. Sections 9 and 11 of the Picker Building are located on Lot 3A.

Lots 3A and 3B were part of the larger Massachusetts Cotton Mill complex, which operated from 1839 until 1928. The Lowell Industrial Development Company obtained ownership of the mill complex property in 1930, after which time the property was used by various entities for light industrial and warehouse uses. The Picker Building is known to have been occupied by Atlas Shoe, Lowell Rubber Co., Inc., the Lowell Paper Box Co. and Universal Heel. The Picker Building has been vacant for many years, and is currently undergoing renovation to be a multi-unit residential apartment building. After remediation (described below), the courtyard will be renovated to be open space for use by residents. There are no immediate plans to renovate the Boiler House, although its future renovation is possible.

The land comprising most of Lot 3B (Boiler House and courtyard) and the eastern portion of Lot 3A (Section 11 of the Picker Building) was created by filling along the Merrimack and Concord Rivers in the late 1890s and early 1900s. This fill material is comprised mostly of poorly sorted silts, clays and sands containing anthropogenic debris, such as coal, coal ash, coal slag, brick, concrete pieces, crushed concrete, glass and metal pieces. Coal ash was observed to approximately 17 or 18 feet below grade. Plastic pieces were observed in the 0-1 foot interval of the courtyard. Below the

fill layer, soils are mostly comprised of well sorted silts or silts and clays to the bottom of the borings (i.e., 25 feet below grade). At the east end of the courtyard, petroleum-stained soils (or product or sheen) were immediately beneath the coal bunker and from approximately 2.5 feet to 16.5 feet below grade immediately adjacent to the coal bunker; removed from the bunker, petroleum-stained soils (or product or sheen) observed in borings B-1, B-3 and B-4 at approximately 17.5 to 19 feet below grade.

GEC measured depth to groundwater on August 19, 2015. GEC-1 was found to contain a viscous NAPL and depth to groundwater could not be measured with the oil-water interface probe. Depth to water was measured at 22.70 feet for GEC-2 and 19.87 feet for GEC-3. The direction of groundwater flow could not be determined based on the limited number of viable monitoring wells. However, it likely is variable beneath the courtyard, and generally toward or parallel to the Merrimack and Concord Rivers (i.e., likely flows to the north, northeast and east).

During 2015 and 2016, releases associated with the courtyard were discovered and reported to MassDEP and assigned four release tracking numbers (RTNs). Each release is briefly described below.

1. RTN 3-33101: Non-aqueous phase liquid (NAPL) was observed in monitoring well GEC-1, located in the courtyard, on August 19, 2015. This condition was reported to MassDEP on August 21, 2016 as a 72-hour reportable condition. An Immediate Remedial Action (IRA) Plan was submitted on October 20, 2015, outlining planned removal of the two gasoline USTs, fuel oil bunkers, excavation of petroleum-contaminated soils for off-Site recycling, treatment or disposal, and subsequent test boring and monitoring well installation program.
2. RTN 3-33474: The IRA for RTN 3-33101 began in February 2016. At that time, a stockpile (designated SP-1) of soil was observed in the courtyard, which was generated when the Picker Building renovation contractor cleaned out the window wells for the Picker Building and scraped a small section of courtyard soils to move the stockpile away from the Picker Building. Disposal criteria testing of the stockpile soils was conducted, so that the soils could be removed from the courtyard. The SP-1 soil sample was found to contain 63 mg/kg PCBs (identified as Aroclor 1254), 23 mg/kg arsenic, 2,400 mg/kg lead, 3,500 mg/kg vanadium, 1,100 mg/kg zinc and 0.29 mg/kg heptachlor epoxide. Each of these hazardous materials was detected at a level exceeding its applicable RCS-1 Reportable Concentration. This second release was reported to the MassDEP as a 120-day reportable condition on March 17, 2016 and was assigned RTN 3-33474. Subsequent investigations of soils in the courtyard confirmed the presence of PCBs, metals and insecticides in shallow soils (mostly top 0-6 foot interval) and identified a hot spot of PCB-contaminated soils (up to 100 mg/kg PCBs). The IRA Plan for RTN 3-33101 was modified to include the contaminants of RTN 3-

33474, and submitted on April 19, 2016, because the PCB, metal and insecticide contaminated soils had to be addressed before the remediation of the petroleum-contaminated soils could continue. The PCB hot spot soils were excavated and combined with the SP-1 stockpile soils and were properly disposed offsite (as part of the IRA).

3. RTN 3-33793: On September 8, 2016, an oily sheen was observed seeping beneath the retaining wall of the courtyard into the Concord River. The oily sheen is likely attributable to a drop in the groundwater table as a result of the on-going drought. The tops of the groundwater table and surface water of the Concord River have dropped to below the bottom of the retaining wall separating the courtyard and river. This presence of separate-phase oil on surface water is a Condition of Substantial Release Migration associated with RTN 3-33101, and is a separate 72-hour reportable condition. This condition was reported to MassDEP on September 8, 2016.
4. RTN 3-33853: Asbestos fibers were discovered in the courtyard soils as a result of follow-up investigations required by the MassDEP Bureau of Air and Waste, following their inspection of the property on June 9, 2016. The asbestos contamination is commingled with the PCB/metal/insecticide contamination. At that time the IRA for RTN 3-33474 was put on hold. By that time 0-1 to 0-3 foot interval PCB-contaminated soils had been excavated from portions of the property and placed either in on-Site soil repositories (four manholes and a modified coal chute) or were stockpiled on-Site. The soils were covered with polyethylene sheeting and plywood, pending regulatory approval to remediate the asbestos-contaminated soils. MassDEP requested that the asbestos release be reported as a 2-hour reportable condition, even though the mass of asbestos released and time period over which it was released is unknown. On October 12, 2016, a BWSC128 Release Notification form was submitted to MassDEP for the asbestos release, as a 2-hour reportable condition. The asbestos-contaminated soils would be remediated under a Non-Traditional Asbestos Abatement Work Plan under the MassDEP Bureau of Air and Waste and an IRA under the MassDEP Bureau of Waste Site Cleanup.

Substantial investigations have been conducted for the courtyard and vicinity and are documented and interpreted in the Phase I Initial Site Investigation Report, submitted on August 29, 2016 and subsequent combined IRA Plan Modification for RTN 3-33101 / IRA Plan for RTN 3-33793 / IRA Plan for RTN 3-33853, submitted on November 2, 2016, and Release Abatement Measure (RAM), submitted for RTN 3-33474, submitted on December 1, 2016.

Based on the available data, the disposal site (considering all four RTNs) encompasses the courtyard and extends a short distance into the Concord River to the confluence with the Merrimack

River. The courtyard is surrounded by the Boiler House, all three sections of the Picker Building and the Concord River. Where building does not exist, the courtyard is contained by fencing. Access to the courtyard is limited to doorways, which are kept locked. Signs are posted prohibiting access by all people except authorized personnel. Soils and the soil stockpile in the courtyard are currently covered with poly sheeting.

Based on the history of Lot 3B, including the vacancy of the Boiler House since at least 1965 and the occurrence of the fire in 1965, a conclusion was made that the releases associated with RTNs 3-33101 and 3-33474 likely occurred prior to the effective date of the federal Toxic Substance Control Act (TSCA), which provides federal regulations pertaining to the clean-up of PCB contaminated sites. However, levels of PCBs in excavated soils were greater than 50 mg/kg, which means that TSCA applies to this PCB-contaminated Site.

PCB analysis of soil samples was conducted for Aroclor PCBs via USEPA Method 8082 with Soxhlet extraction, with a subset of soil samples analyzed for PCB congeners via USEPA Method 8270. The PCBs were identified mostly as Aroclor 1254, with infrequent and lower levels of Aroclor 1260 also identified. The PCBs detected in soils was found to contain up to 11% dioxin-like PCB congeners. Each detected dioxin-like PCB congener had the same toxicity equivalence factor (TEF) of 3E-05 (0.00003).

The PCB contamination was detected at the highest concentrations in the shallowest soils, and gradually diminished with depth. Following the removal of the PCB hot spot soils at B-11, the mean, 95th percentile upper confidence limit on the mean and maximum concentrations for the 0-3, 3-6 and 6-15 foot intervals, based on original grade in April 2016, are provided below (calculated in Appendix N Tables N-2 to N-4).

Summary of Total PCB Concentrations in Courtyard Soils (mg/kg)

| Depth Interval (feet) | Mean Concentration | 9 th % Upper Confidence Limit on Mean | Maximum Concentration |
|-----------------------|--------------------|--|-----------------------|
| 0 to 3 | 10 | 14 | 42 |
| 3 to 6 | 3.2 | 4.1 | 29 |
| 6 to 15 | 0.63 | 0.90 | 6.2 |

The petroleum contamination is located at the east end of the courtyard and is comprised of no. 6 fuel oil. The highest levels of petroleum contamination were detected beneath and in the immediate vicinity of the FO-1 fuel oil bunker. Immediately adjacent to the FO-1 fuel oil bunker, the petroleum contamination extends from approximately 3 feet below original grade to the water table. Further east and south of the fuel oil bunker, the petroleum contamination is located above and across the water table. Petroleum-saturated soils were observed in these locations.

The PCB and petroleum analytical data were evaluated to determine the extent to which the PCB and petroleum contamination is commingled. The PCB levels in soil samples containing more than 2,000 mg/kg total petroleum hydrocarbons (TPH) or total extractable petroleum hydrocarbons (EPH) were evaluated to determine to what extent the PCB and petroleum contamination is commingled. This evaluation, documented in the table below, indicates that there is a low level, but not significant, commingling of PCB and petroleum contamination.

| Boring | Depth (feet)* | Total EPH (mg/kg) | TPH (mg/kg) | PCBs (mg/kg) |
|---------------|----------------------|--------------------------|--------------------|---------------------|
| FO-1 | 4-5 | | 33,000 | 0.45 |
| B-4 | 12-17 | 5,370 | | Not tested |
| B-5 | 3-8 | 2,450 | | 0.29 |
| B-14A | 0-5 | 13,000 | | <0.15 |
| B-14A | 5-10 | 5,900 | | 0.14 |
| B-14A | 10-15 | 34,300 | | 0.14 |
| B-14A | 15-16.5 | 2,240 | | <0.13 |
| B-15 | 5-10 | 8,540 | | 0.30 |
| B-19 | 15-17 | 2,530 | | Not tested |
| B-21 | 5-10 | 4,460 | | 0.75 |
| Comp 1 | | | 3,200 | 0.26 |
| Comp 2 | | | 3,100 | 1.3 |
| Comp 3 | | | 2,100 | 0.17 |
| Comp 4 | | | 2,100 | 0.34 |

*Depth below current grade (as of 10/1/2016)

During June 2016, asbestos, identified mostly as chrysotile, was detected in the approximately 300-400 cubic yard stockpile generated as part of the IRA for RTN 3-33101 as well as in the shallow, exposed courtyard soils. Subsequent investigations indicated that the asbestos contamination does not extend more than 5 feet below grade, at least at the east end of the courtyard, where the fuel oil vaults are located. The asbestos is commingled with the shallower PCB, metal and insecticide contamination but does not appear to be commingled with the petroleum contamination.

The key metal contaminant in terms of magnitude of detection and distribution across the courtyard is vanadium. It is a common constituent of coal, and its presence in the soils of the courtyard is likely attributable to the long-term use of coal to fire the boiler in the Boiler House and the coal ash found throughout the fill land of the courtyard. A derelict coal chute is still located in the courtyard. The soils of the courtyard contain a large proportion of coal and coal ash, especially for the original 0-3 foot interval. In some areas, the soils contain more coal ash than sands, silts or clay. The highest levels of vanadium were detected in the 0-3 foot interval, with lower levels in the 3-6 and 6-15 foot intervals. The table below provides the mean and maximum concentrations detected of vanadium for each soil interval, based on the original grade in March 2016.

Concentration of Vanadium in Soils (mg/kg)

| Soil Interval (feet) | Mean Concentration | Maximum Concentration |
|----------------------|--------------------|-----------------------|
| 0 to 3 | 347 | 2100 |
| 3 to 6 | 145 | 900 |
| 6 to 15 | 172 | 870 |

The soil sample containing the highest level of total chromium did not contain any hexavalent chromium; therefore, the detected chromium in the soil samples was presumed to be trivalent.

The OHM detected at the Site are non-volatile or poorly soluble. Therefore, soil vapor intrusion to indoor air is unlikely to be a significant migration pathway and leaching of dissolved-phase OHM to groundwater is unlikely to be significant.

The Merrimack River abuts the north side of the property and generally flows from southwest to northeast in the vicinity of the property. The Concord River abuts the east side of the property and generally flows from south to north in the vicinity of the property. Based on an evaluation of the available soil and groundwater data, the OHM are unlikely to be significantly present in a dissolved state in groundwater. The NAPL present in the courtyard is comprised of no. 6 fuel oil, was likely released 40 or more years ago, and is located in silts. Therefore, the NAPL was not expected to have significant macro-scale mobility (i.e., Non-Stable NAPL). However, during this summer and fall, the region experienced an extreme drought and the water level in the Concord River (and likely the groundwater table) dropped below the bottom of the retaining wall separating the courtyard from the river. As a result, an oily sheen was observed discharging from below or through the retaining wall into the Concord River. Since the drought condition eased and the water levels rose, the discharge of oily water has ceased. The NAPL present in the courtyard is non-stable and has both macro-scale and micro-scale mobilities. The Non-Stable NAPL is the source of the oily discharge to the surface waters of the Concord River during drought conditions, and is considered a continuing source of contamination requiring remediation, if feasible.

The remaining contaminants are generally poorly soluble and non-volatile and are not located significantly below 6 feet. Given that the depth to groundwater is greater than 19 feet below grade, a significant impact to groundwater is not expected.

Potential human receptors include future residents of the Picker building and/or Boiler House, future commercial/industrial workers, current and future construction workers and future utility workers. Based on current conditions, there is no Imminent Hazard because the courtyard is enclosed by buildings and fencing along the Concord River, and the access doors are locked. Exposure pathways are those related to soils and include dermal contact, incidental ingestion and inhalation of dusts.

Three Site-specific risk assessments have been conducted, each for one or more of the following reasons: (1) to determine what soil intervals require remediation for the PCB-, metal- and insecticide-contamination in order to achieve No Significant Risk of harm; (2) to determine whether the petroleum contamination significantly affects the risk assessment findings; and (3) to derive Site-specific cleanup standards for PCB-contaminated soils. The following assumptions limiting future activities and uses of the courtyard were assumed in the final risk assessment: (1) no single-family residential use; (2) no buildings or other structures will be constructed on the courtyard soils; (3) the protective barrier can be covered hardscaping and ornamental landscaping, but no trees or bushes with root structures deeper that could penetrate the protective barrier and marker layer are allowed to be planted in the protective barrier; (3) all soils will be placed beneath a protective barrier comprised of three feet of clean soil overlying a marker layer; (4) subsurface utility lines will be installed in clean utility corridors; (5) the soils below the protective barrier will not be excavated or otherwise disturbed in the future, unless under the oversight of a LSP and first notifying the USEPA Region I and MassDEP; and (6) the courtyard would be used as passive recreational open space for future residents of the Picker building and, perhaps, Boiler House. Presuming these limits on future activities and uses, the risk assessments found No Significant Risk of harm for all soils except those in the 0-3 foot interval. The principal risk driver was PCB.

Therefore, the 0-3 foot interval soils are presumed: (1) placed in isolated soil repositories to be located beneath the protective barrier; and/or (2) transported off-site to an appropriate hazardous waste facility. The repositories would be designed to keep the soils inside the repositories separated from the remainder of the soils beneath the protective barrier. Because use of the repositories would result in no exposure in the future, there would be No Significant Risk of exposure to users of the courtyard.

The risk assessment did not include risks associated with asbestos exposure. The detection of asbestos in soils is presumed to be evidence of Significant Risk of harm. Mostly, the asbestos-contaminated soils are commingled with the shallow PCB-contaminated soils. Therefore, soils to be placed in the repository include the 0-3 foot interval PCB- and asbestos-contaminated soils and any other asbestos contaminated soils if they extend deeper than 3 feet below grade. No disturbance of the repositories would be allowed, unless under the oversight of both an LSP and an Asbestos Manager and first notifying USEPA Region I and the MassDEP.

Together, the protective barrier and isolated soil repositories are designed to mitigate/eliminate exposure to PCB- and asbestos-contaminated soils, and are an alternative to a TSCA cap.

2.0 DATA USABILITY & REPRESENTATIVENESS EVALUATION

A representativeness evaluation and data usability assessment were conducted to support a Response Action Outcome, in accordance with 310 CMR 40.1056(2)(k) and consistent with MassDEP guidance, *MCP Representativeness Evaluations and Data Usability Assessments*, Policy WSC-07-350, dated September 19, 2007. This evaluation and assessment focuses on whether the available information supports the conclusions that: (1) disposal site conditions are adequately characterized; (2) risks to health, safety, public welfare and the environment have been adequately addressed (i.e., all Exposure Pathways have been identified, Exposure Point Concentrations meet the applicable cleanup requirements); (3) areas requiring remediation have been identified; and (4) cleanup goals have been adequately identified.

2.1 Representativeness Evaluation

According to MassDEP's policy: *The Representativeness Evaluation is an evaluation and demonstration of the adequacy of the spatial and temporal sets used to support the RAO. The Representativeness Evaluation determines whether the data set in total sufficiently characterizes conditions at the disposal site and supports a coherent Conceptual Site Model. The Representativeness Evaluation determines whether there is enough information from the right locations, both spatially and temporally, to support the RAO.*

The policy identifies several different elements that must be considered when conducting a Representativeness Evaluation. The available data and information, relative to each of these elements, are evaluated below.

Use of Field/Screening Data

Field screening of soil samples was conducted using a photoionization detector, the results of which were used to support decisions regarding whether to submit soil samples for analysis of volatile petroleum hydrocarbons (VPH) and/or volatile organic compounds (VOCs). This evaluation was done in conjunction with visual and olfactory observations during soil boring. This approach would tend to err on the side of obtaining higher detected levels of VPH and VOCs in soil.

Depth to groundwater was measured to determine depth to the water table and to determine the presence or absence of free phase product in the subsurface.

Sampling Rationale

GEC advanced test borings within the courtyard, as well as beneath the Picker Building south of the courtyard. The test boring programs were conducted to collect soil samples in order to

determine the magnitude, horizontal and vertical extent of petroleum, PCBs, metals, insecticides, and asbestos contamination in soils. The samples were collected from specific intervals to determine the relative levels of contamination across horizons and the extent to which there is commingling between PCB-, asbestos- and petroleum-contaminated soils. Sufficient soil samples were collected to support risk assessments for all OHM except asbestos. Wherever asbestos was detected, a Significant Risk of harm was presumed to exist. Additional samples were collected and analyzed for purposes such as: (1) to determine if the chromium detected in soils is hexavalent chromium; (2) to determine the type of petroleum contamination present in soils (i.e., no. 6 fuel oil); (3) to obtain disposal criteria for soils that have been or may be transported off-Site to a receiving facility; (4) to determine the percentage and type of dioxin-like PCBs present in soils; (5) to determine whether any hot spots of PCB-contaminated soils exist; and (6) for the one PCB hot spot identified, to determine the horizontal and vertical extent of the hot spot and to obtain confirmatory soils samples following the excavation of the hot spot.

Groundwater samples were collected as part of a due diligence investigation to evaluate the impact of the petroleum contamination on groundwater. Groundwater samples were analyzed for EPH, polycyclic aromatic hydrocarbons (PAHs), VPH and target VOCs. No groundwater samples have been collected for analysis of PCBs, metals, insecticides and asbestos, because the monitoring wells were destroyed during the IRA activities. The depth to groundwater is 19 feet or more below grade, significantly below the PCB, metal, insecticide and asbestos contamination. Therefore, an impact to groundwater from these OHM is not expected.

Because the OHM detected in the soils are relatively non-volatile, no soil vapor or indoor air were collected for analysis. Surface water was collected from the Concord River, near the retaining wall, and analyzed for certain OHM to determine if a dissolved-phase impact to the surface water was possible and to obtain disposal criteria data.

Critical Samples are the following:

- (1) soil samples collected from the 0-3 and 3-6 foot intervals of the courtyard for analysis of PCBs (Table 1 of EPA Risk-Based Application);
- (2) four soil samples collected for analysis of PCB congeners (Tables 6.1 to 6.4);
- (3) soil samples collected for analysis of asbestos (Table 7); and
- (4) soil samples collected near fuel oil vault FO-1 for analysis of EPH and PAHs.

Number, Spatial Distribution and Handling of Samples

Soil, groundwater and surface water samples were collected from the subject Site by GEC. GEC collected soil samples for analysis during the period 2015 to 2016, as described in the chart below.

Soil Sampling

| Analyses | In Courtyard | Beneath Picker Building |
|---|--------------|-------------------------|
| PCBs via USEPA Method 8082 with Soxhlet Extraction | 82 | |
| PCBs via USEPA Method 8082 not using Soxhlet Extraction | 1 | |
| PCB Congener via USEPA Method 8270M | 4 | |
| MA14 Metals via USEPA Methods 6010C-D / 7471B | 21 | |
| Arsenic, lead and thallium via USEPA Method 6010C-D | 4 | |
| Thallium via USEPA Method 6010C-D | 15 | |
| TCLP cadmium, chromium and lead via USEPA Methods 6010C-D / 1311 | 1 | |
| Hexavalent chromium, oxidation-reduction potential and pH via USEPA Methods 7196A / 9045C and SM2580A | 1 | |
| Pesticides via USEPA Method 8081B | 24 | |
| Herbicides via USEPA Method 8151A | 12 | |
| Asbestos | 24 | |
| TPH via USEPA Method 8100 Modified or 8015C | 8 | |
| EPH and PAHs via MADEP-EPH-04-1.1 | 50 | 6 |
| VPH and target VOCs via MADEP-VPH-04-1.1 | 14 | 6 |
| VOCs via USEPA Method 8260C | 8 | |
| Semi-volatile organic compounds (SVOCs) via USEPA Method 8270D | 11 | |
| Reactive cyanide via USEPA Method 9014 | 7 | |
| Reactive sulfide via USEPA Method 9030A | 7 | |
| pH via USEPA Method 9045C | 7 | |
| Ignitability via USEPA Method 1030 | 7 | |
| Specific conductance via USEPA Method 2510B Modified | 7 | |

Most of the soil samples were collected from the courtyard. Samples were collected from the breadth of the courtyard, and from the 0-1 foot interval to 15-20 feet below grade. Soil samples were handled in accordance with GEC's Standard Operation Procedures and MassDEP's Compendium for Analytical Methods. For the PCB samples, only one out of eighty-three soils samples were not extracted by the TSCA-required Soxhlet extraction method. This one soil sample was a composite sample from stockpile SP-1 and this stockpile was later transported off-Site to a hazardous waste facility. The soil analytical data are summarized in Tables 1, 3, 4, 6.1 to 6.4 and 7 of the EPA Risk-Based Application.

Groundwater samples were collected for analysis in August 2015, as described in the chart below.

Groundwater Sampling

| Analyses | Courtyard Monitoring Wells |
|---|----------------------------|
| EPH and PAHs via MADEP-EPH-4-1.1 | 3 |
| VPH and target VOCs via MADEP-VPH-4-1.1 | 1 |

The groundwater samples were originally collected as part of a due diligence investigation. Groundwater samples were collected in accordance with GEC's Standard Operation Procedures, with the following qualification. Groundwater recharge was very slow following well development. Therefore, on the day the samples were collected, groundwater samples were collected without first evacuating each monitoring well. Monitoring well GEC-1 contained viscous no. 6 fuel oil, during groundwater sampling. Refer to Table 2 of the EPA Risk-Based Application for a summary of groundwater analytical data.

Concord River Surface Water Sampling

| Analyses | Concord River, Near Retaining Wall |
|---|------------------------------------|
| PCBs via USEPA Method 8082A | 1 |
| VOCs via USEPA Method 8260C | 1 |
| MA14 Metals via USEPA Methods 6020A-B / 7470A | 1 |
| Flashpoint via USEPA Method 1010A | 1 |
| pH via SM21-22 4500 H B | 1 |

The surface water samples were collected adjacent to the retaining wall, during a drought period when oily water was discharging through or beneath the wall into the Concord River, to collect disposal criteria data. Groundwater samples were collected and handled in accordance with GEC's Standard Operation Procedures and MassDEP's Compendium for Analytical Methods. Refer to Table 8 of the EPA Risk-Based Application for a summary of surface water analytical data.

Temporal Distribution of Samples

One round of groundwater sampling was conducted in August 2015. Because petroleum hydrocarbon contamination, comprised of no. 6 fuel oil, was found to extend in soils and in free phase to the water table, significant dissolved-phase petroleum contamination was not expected. Because remediation to near or beneath the water table was planned, additional sampling of groundwater for petroleum hydrocarbons was not conducted. The monitoring wells were destroyed during the early phase of the IRA; therefore, groundwater samples have not been analyzed for other OHM found in soils. However, except for the petroleum contamination, other soil contaminants do not extend significantly more than 6 feet below grade (significantly above the water table located approximately 19 feet below grade) and are not expected to impact the groundwater. Following

completion of the remediation, new monitoring wells will be installed and temporal analytical data will be collected.

Soil samples were collected during the period August 2015 to September 2016. Given the age of the release (>40 years) and the persistent nature of the OHM detected in soils, temporal samples for soils are not needed.

Only one round of surface water sampling was collected for each analysis. However, these samples were collected between the period September 27 and October 3, 2016. During this period, oily water was discharging through or beneath the retaining wall into the Concord River and the surface water level in the Concord River was shallow due to the drought. In addition, the samples were collected from a contained area of the river next to the retaining wall. These factors would tend to increase any measurable impact to the surface water of the river from discharges through the retaining wall. Hence, the available surface water data represent reasonable worst-case conditions.

Completeness

As with all sites, additional sampling and analyses could be conducted to address uncertainties in the data set. However, sufficient data exists to support the MassDEP conditionally-approved Immediate Response Action, MassDEP conditionally-approved Release Abatement Measure and the EPA Application for Risk-Based Cleanup of PCBs. In particular, data was obtained for all samples identified as critical. The existing data is considered complete.

Inconsistency and Uncertainty

Most of the PCB data was obtained based on analysis of PCB Aroclors via USEPA Method 8082A with Soxhlet extraction. Limited PCB congener data was obtained via USEPA Method 8270M. Three out of four of these samples contained significant levels of total PCB congeners, ranging between 3.385 and 22.245 mg/kg, respectively (Table 6.1 to 6.4 of the USEPA Risk-Based Application). These three samples contained a consistent percentage of the total PCB congeners with dioxin-like toxicity, ranging between 9.9 and 11%. Each of the PCB congeners with dioxin-like toxicity had the same toxic equivalence factor (TEF) (relative to 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD)). Therefore, the Aroclor PCB data, percentage of PCB congeners with TCDD toxicity, and TEF do derive the exposure point concentrations for PCBs with dioxin-like toxicity.

No other significant inconsistencies or uncertainties were identified in the data set.

Information Considered Unrepresentative

The following data are considered unrepresentative of Site conditions:

| Unrepresentative Data | Description |
|---|--|
| Soil data for B-11(0-1'), B-11-r5A(0-1'), B-11-r5B(0-1'), B-11-5rC(0-1') and SP-1 | These soils from which these samples were collected were transported off-site to a facility approved to accept PCBs containing 50 mg/kg PCBs or more. These samples are no longer considered representative of current conditions. |

2.2 Data Usability Assessment

The Data Usability Assessment has both an analytical and field component. According to MassDEP's policy, *it is used to evaluate whether analytical data points are scientifically valid and defensible, and of a sufficient level of precision, accuracy and sensitivity to support the RAO* [now referred to as the Permanent Solution].

Analytical Data Usability Assessments / Data Evaluation Criteria

The data collected to support the Permanent Solution was obtained following the release of MassDEP's *Compendium of Analytical Methods Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data in Support of Response Actions Conducted Under the Massachusetts Contingency Plan (MCP)* (WSC-CAM-VIIA) (CAM). The following data sets were identified as representative of current Site conditions and were evaluated for compliance with the CAM. The samples were mostly submitted to Con-Test Analytical Laboratory (Con-Test), with wipe test samples submitted to Alpha Analytical Laboratories (Alpha). All samples were submitted to the laboratory under chain-of-custody documentation, and were received by the laboratory in good condition.

All soil data collected for the following analyses meet the requirements for Presumptive Certainty specified by CAM: USEPA Method 8082A for PCBs; USEPA Method 8081B for chlorinated pesticides; USEPA Method 8151A for chlorinated herbicides; USEPA Method USEPA Method 8260 for VOCs; USEPA Method 8270D for SVOCs; USEPA Method 6010C/D for 13 of the MA14 metals; USEPA Method 7471B for mercury; USEPA Method 7196A for hexavalent chromium; MADEP-EPH-04-1.1 for EPH and PAHs; and MADEP VPH-04-1.1 for VPH and target VOCs. PCB congeners were analyzed via USEPA Method 8270M, which is a modification of the CAM method USEPA Method 8270D. Although no MCP Form was prepared for this lab report, it met all the other CAM requirements. All other analytical methods are not contained within CAM and the data from these analytical methods were generally used to disposal criteria testing. No CAM-approved method is available for asbestos; however, the asbestos data were used determine if asbestos was present or not. If present, it was presumed to constitute a Significant Risk of harm and require remediation. The list of analytical reports applicable to the Site is provided below.

| Lab ID | Lab Date | Chain of Custody | Media | Sample Date | PCBs | Meets Presumptive Certainty |
|-----------|-----------|------------------|--------------------------|-------------|------|-----------------------------|
| 15H0761_1 | 2015-8-26 | Y | Soil | 2015-8-14 | N | Y |
| 15H0854_1 | 2015-8-26 | Y | Groundwater | 2015-8-18 | N | Y |
| 16B0685_2 | 2016-2-12 | Y | Soil | 2016-2-12 | N | |
| 16C0365_2 | 2016-3-11 | Y | Soil (TCLP) | 2016-2-29 | N | Not Applicable |
| 16B1140_2 | 2016-6-3 | Y | Soil (disposal criteria) | 2016-2-29 | Y | Y |
| 16C0400_2 | 2016-3-11 | Y | UST Contents Aqueous | 2016-3-7 | Y | Pending |
| 16C0420_2 | 2016-3-11 | Y | Soil | 2016-3-8 | Y | Y |
| 16C0454_2 | 2016-3-15 | Y | Soil | 2016-3-9 | Y | Y |
| 16C0588_2 | 2016-3-16 | Y | Soil | 2016-3-9 | N | Y |

| | | | | | | |
|-----------|------------|---|---|-----------|---|----------------|
| L1606873 | 2016-3-14 | Y | Wipe Sample | 2016-3-9 | Y | Y |
| 16C0453_2 | 2016-3-14 | Y | Soil | 2016-3-10 | Y | Y |
| 16C0641_2 | 2016-3-17 | Y | Soil | 2016-3-14 | Y | Y |
| 16C0644_2 | 2016-3-22 | Y | Soil | 2016-3-14 | N | Y |
| 16C0665_2 | 2016-3-25 | Y | Soil – PCB congeners | 2016-3-14 | Y | |
| 16C0985_2 | 2016-3-25 | Y | Soil (TCLP) | 2016-3-14 | N | Not Applicable |
| 16C1045_2 | 2016-3-30 | Y | Soil | 2016-3-14 | N | Y |
| 16C1046_2 | 2016-3-30 | Y | Soil | 2016-3-14 | N | Y |
| 16C1053_2 | 2016-3-28 | Y | Soil | 2016-3-14 | N | Y |
| 16C0867_2 | 2016-3-23 | Y | UST Contents Aqueous | 2016-3-18 | N | Pending |
| 16C1146_2 | 2016-3-31 | Y | Soil | 2016-3-23 | Y | Y |
| 16C1374_2 | 2016-4-6 | Y | Soil (disposal criteria) | 2016-3-29 | Y | Y |
| 16C1456_2 | 2016-4-7 | Y | Soil | 2016-3-30 | Y | Y |
| 16E1240_2 | 2016-6-1 | Y | Soil | 2016-5-27 | Y | Y |
| 16J0632_2 | 2016-10-20 | Y | Soil | 2016-9-15 | Y | Y |
| 16J0503_2 | 2016-10-20 | Y | Soil | 2016-9-16 | Y | Y |
| 16J0708_1 | 2016-9-23 | Y | Soil | 2016-9-16 | Y | Y |
| 16I1233_1 | 2016-10-5 | Y | Soil (asbestos only) | 2016-9-16 | N | Not Applicable |
| 16I1233_1 | 2016-9-22 | Y | Soil (asbestos) | 2016-9-16 | Y | Not Applicable |
| 16I0700_1 | 2016-9-23 | Y | Soil (disposal criteria) | 2016-9-16 | Y | Y |
| 16I1257_1 | 2016-10-05 | Y | Containment Water (PCB, VOCs, MA14 metals) | 2016-9-27 | Y | Y |
| 16I1385_2 | 2016-10-7 | Y | Soil & Containment Water (water-flashpoint) | 2016-9-30 | Y | Y |
| 16J0047_2 | 2016-10-21 | Y | Surface Water (pH) | 2016-10-3 | N | Not Applicable |
| | | | | | | |

All analyses were conducted for the full analyte list specified by CAM for each analytical method, except as provided below:

1. Certain soil samples were only analyzed for arsenic, lead and/or vanadium, and not for the full suite of MA14 metals. The limited analyses were conducted only when other metals were eliminated as key contaminants of concern in terms of risk.
2. Analytical method USEPA Method 8270 was conducted for 15 soil samples, of which 11 were for the full suite of SVOC target analytes and 4 were for PCB congeners only. The PCB congener analyses were conducted solely to determine which PCB congeners are present with dioxin-like toxicity. Sufficient SVOC data exists to determine that the most important 8270 analytes are PAHs and that other CAM SVOC analytes were rarely detected. MADEP-EPH-04-1.1 supplemented the PAH analytical data set by 50 samples; therefore, there are 61 samples providing PAH data.

All CAM reporting limits were met for key contaminants of concern (PCBs, EPH, PAH, metals and pesticides) unless specified below. Certain data did not meet the quality control (QC) parameters specified by the CAM protocol for the applicable analytical method. However, unless it affected one of the key contaminants of concern, it is not of importance to this evaluation and is not described below.

All analytes for all samples met the CAM reporting limits, except as identified below.

| Media / Date | Laboratory | Issue |
|---------------------------|------------|--|
| Soil / 8-14-2015 | Con-Test | B-4 15-20' and B-5 15-20': Elevated reporting limit for C5-C8 aliphatic hydrocarbons and naphthalene for VPH-04-1.1, due to high concentration of target compounds. Massachusetts CAM reporting limits are not met. |
| Soil / 3/10/2016 | Con-Test | FO-1 BTM: Elevated reporting limit (4.9 mg/kg) for hexavalent chromium due to sample matrix interference. |
| Soil / 3-15-2016 | Con-Test | Several soils samples with elevated EPH: Elevated reporting limit for certain PAHs due to sample matrix interference. |
| Soil / 9/16/2016 | Con-Test | Comp-1 to Comp-4: Elevated reporting limit for 8270D due to sample matrix interference. Massachusetts CAM reporting limits were not met. Petroleum hydrocarbon contamination present. These samples were disposal criteria tested. |
| Surface water / 9/27/2016 | Con-Test | Surface water: Elevated reporting limits for VOCs due to sample matrix interference. Massachusetts CAM reporting limits were not met. |

Analytical data sets often have one or more issues identified in the case narrative, pertaining to QA/QC. These conditions are further identified in the laboratory reports. If any of these issues resulted in a finding of “gross failure” under CAM, they are identified below. Some samples collected for VPH analysis contained soil/methanol ratio that was not consistent with method specifications for MADEP-VPH-04-1.1. Because methanol was present, they did not meet the

method criterion for gross failure. A few samples exceeded holding times for extraction or analysis. However, none exceeded the two-fold holding time exceedance to result in “gross failure.”

| Media / Date | Laboratory | Gross Failure Issue |
|--------------|------------|---------------------|
| None | None | None |

Field Data Usability Assessment

Field data collected by GEC during the field investigations included the following: (1) visual and olfactory observations of soil recoveries collected during soil borings; (2) soil headspace screening using a PID; and (3) groundwater and product gauging data. Field observations and PID headspace screening results were used, in part, to select soil samples for analysis. Gauging data was used to determine depth to groundwater table and product thickness. These field data were collected in accordance with GEC’s Standard Operating Procedures. No field data were used in place of analytical data in the risk characterization. Field data augmented the analytical data to determine the vertical and horizontal extent of soil contamination (most notably the petroleum contamination).

Rejection of Analytical Data as the Result of Gross Failure

The data used in support of the Phase II, risk characterization and Permanent Solution were assessed against the criteria indicative of “gross failure” in quality control, as described in Appendix IV of MassDEP’s guidance, *Representativeness Evaluations and Data Usability Assessments*. For inorganic compounds, criteria indicative for “gross failure” exist for holding times, laboratory control samples and laboratory control sample duplicates and matrix spike recoveries. For organic compounds, criteria indicative of “gross failure” exist for holding time, sample preservation for VOC analyses, laboratory control samples and laboratory control sample duplicates, surrogate recoveries, matrix spike and matrix spike duplicate recoveries, calibration, internal standards, fractionation check standard recoveries for EPH analyses, and dual column precision for PCB analyses.

If a sample is held more than two-fold beyond its holding time, then it meets the holding time criterion for rejection for “gross failure”. Almost all the samples were extracted and/or analyzed within the applicable analysis hold times. A few samples were activated for analysis based on the results of companion samples, but after an applicable hold time. No sample was extracted or analyzed more than two-times the applicable hold time. No sample was rejected based on exceeding the holding time.

Based on the available laboratory reports, all soil and water samples were properly preserved. No sample was rejected based on exceeding the preservation criterion for “gross failure”.

For each sample / analysis, no laboratory control sample and / or laboratory control sample duplicate recoveries were less than CAM's recommended criteria for gross failure. None of the OHM detected in any sample met the laboratory control sample criterion for "gross failure" rejection.

No data for Site-specific contaminants of concern collected from this Site met the criteria for "gross failure"; therefore, no data were rejected on this basis.

2.3 Conclusions

The data set relied upon to support the MassDEP conditionally-approved IRA, MassDEP conditionally-approved RAM and USEPA Application for Risk-Based Cleanup of PCBs meets the CAM requirements for presumptive certainty, is scientifically valid, and is of sufficient accuracy, precision and completeness. The data is also sufficiently representative with regards to the spatial and temporal distribution of sampling points. Decisions in sampling location were made that would tend to err on the side of obtaining over-estimates of OHM concentrations. Therefore, the resulting risk assessments rely on data that would contribute to a conservative estimate of risk.